REMARKS/ARGUMENTS

The Examiner is thanked for the Office Action mailed April 20, 2007. The status of the application is as follows:

- Claims 1-20 are pending. Claims 1-5 have been amended. Claims 6-20 have been added.
- Claim 3 is objected to for depending on a rejected base claim.
- Claims 1 and 4 are objected to for informalities.
- Claim 5 is rejected under 35 U.S.C. 101 as being directed towards non-statutory subject matter.
- Claims 1-5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
- Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Ning (US 6,075,836 A).
- Claim 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ning in view of Popescu et al. (US 2004/0062341 A1).

The objections and rejections are discussed below.

The Objection to Claim 3

The Examiner is thanked for indicating that claim 3 would be allowable if rewritten to overcome the 35 U.S.C. 112, second paragraph rejection (discussed below) and to include all the limitations of the base claim and any intervening claims. Claim 3 has been amended herein as such and, thus, allowance of amended claim 3 is respectfully requested.

The Objection to Claims 1 and 4

Claims 1 and 4 stand objected to for informalities.

With respect to claim 1, the Office has indicated that line 11 should read "reconstruction of an exact 3D back projection" and that the term "weighted" on line 18 should be replaced by "weighting." Line 11 has been amended herein in accordance with the Office's suggestion. Line 18 has been amended herein to include the phrase "performing a" in front of the term "weighted." It is believed that this amendment addresses the noted informality on line 18.

With respect to claim 4, the Office has indicated that line 11 should read "a reconstruction unit configured to reconstruct" and line 13 should read "a control unit configured to control" and that line 14 redundantly refers to claim 1. Lines 11 and 13 have been amended herein in accordance with the Office's suggestion. Line 14 has been amended herein to remove the references to claim 1 and to include the reconstruction steps from claim 1.

It is believed that the above-noted amendments cure the informalities. Therefore, it is respectfully requested that the objections to claims 1 and 4 be withdrawn.

The Rejection of Claim 5 under 35 U.S.C. 101

Claim 5 stands rejected under 35 U.S.C. 101 as being directed towards non-statutory subject matter. In particular, the Office asserts that claim 5 as written is directed towards a computer program, which is non-statutory subject matter. The Office notes that a computer-readable medium encoded with a computer program is statutory subject matter. The rejection of claim 5 should be withdrawn because claim 5 has been amended herein to be directed towards a computer-readable medium encoded with a computer program.

The Rejection of Claims 1-5 under 35 U.S.C. 112, Second Paragraph

Claims 1-5 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 1, the Office notes that lines 4-6 are confusing as they imply that the examination area is rotated about the axis of rotation. Claim 1 has been amended herein to further clarify that the x-ray source, and not the examination area, rotates about the axis of rotation.

The Office also notes that claim 1, lines 14-16, discloses reconstructing a CT image of the examination zone from measuring values comprising steps of determining the partial derivative of measuring values and weighted integration of the derived measuring values and reconstructs absorption values by back projecting the measuring values, but make no further use of the weighted-integrated, partially-derived measuring values. Claim 1 has been amended herein to indicate that the weighted, integrated partial derivative of the measuring values are the measuring values that are back projected.

The Office further notes that claim 1, lines 19 and 21, include the term "relative," which the Office considers to be indefinite since it is not defined in the claims, the specification does not provide a standard for ascertaining the requisite value, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Claim 1 has been amended to remove the term "relative."

The Office also notes that in claim 1, line 21, the limitation "the fan angle" lacks antecedent basis. Claim 1 has been amended to cure this minor informality.

The Office has rejected to claim 2-5 by virtue of their dependency on claim 1.

In view of the above-noted amendments, the rejection of claim 1 and claims 2-5, which depend therefrom, should be withdrawn.

The Rejection of Claims 1-2 under 35 U.S.C. 102(b)

Claims 1-2 are rejected under 35 U.S.C. 102(b) as being anticipated by Ning (US 6,075,836 A). This rejection should be withdrawn because Ning does not teach each and every element as set forth in the subject claims and, therefore, does not anticipate claims 1-2.

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

MPEP §2131.

Amended **independent claim 1** is directed towards a computed tomography method. The method includes, *inter alia*, acquiring measuring values which are dependent on the intensity of a radiation beam that traverses the examination zone and is incident on a detector and reconstructing a CT image of the examination zone from the measuring values. The method requires that the reconstruction be an exact 3D back projection and include the steps of: 1) determining the partial derivative of measuring values of parallel rays with different radiation source positions in conformity with the angular position of the radiation source; 2) performing a weighted integration of the partial derivative of the measuring values along K lines; 3) multiplying the integrated partial derivative of the measuring values by a first weighting factor which corresponds to the cosine of the cone angle of the ray associated with the measuring values and by a second weighting factor which corresponds to the reciprocal value of the cosine of a fan angle of the beam associated with the measuring values, and 4) reconstructing the absorption of each object point by back projection of the weighted, integrated partial derivative of the measuring values. Ning does not teach the above claimed aspects.

Ning is also directed towards computed tomography. However, Ning discloses a substantially different approach for reconstructing tomographic data. For example, Ning employs a reconstruction technique that includes integrating the inverse three-

dimensional Radon transform of a three-dimensional object. (See column 11, lines 6-55, and equation 7). As discussed in the instant application, reconstructing based on Radon inversion requires a relatively large amount of calculation work and give rise to discretization errors in the reconstructed images. (See page 10, lines 12-14).

More particularly, Ning's reconstruction approach includes pre-weighting projection data (See step 802 of Fig. 8 and column 15, lines 15-19), calculating a partial derivative of the pre-weight projection data (See step 804 of Fig. 8 and column 15, lines 19-24), rebinning the partially-derived pre-weighted projection data from the circular orbit and the arc orbit (See steps 806 and 808 of Fig. 8 and column 15, lines 24-29), using the results from the rebinning to obtain a partial derivative and a partial second derivative of the inverse Radon transform (See steps 810 and 812 of Fig. 8 and column 15, lines 30-44), and calculating back projected data as a function of the inverse Radon transform (See step 814 of Fig. 8 and column 15, lines 44-45, and column 11, lines 7-43). Hence, Ning does not teach at least the above-noted aspects of claim 1. Accordingly, this rejection should be withdrawn.

Claim 2 depends directly from claim 1 and is allowable at least by virtue of this dependency.

The Rejection of Claims 4 and 5 under 35 U.S.C. 103(a)

Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ning in view of Popescu et al. (US 2004/0062341 A1). This rejection should be withdrawn because the combination of Ning in view of Popescu et al. does not teach or suggest all the limitations of amended claims 4 and 5 and, therefore, does not establish a *prima facie* case of obvious with respect to claims 4 and 5.

> To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations.

MPEP §2143.

In particular, amended **claims 4 and 5** recite the above-discussed limitations absent from Ning. In particular, amended claims 4 and 5 require reconstructing the measuring values by: 1) determining the partial derivative of measuring values of parallel rays with different radiation source positions in conformity with the angular position of the radiation source; 2) performing a weighted integration of the partial derivative of the measuring values along K lines; 3) multiplying the integrated partial derivative of the measuring values by a first weighting factor which corresponds to the cosine of the cone angle of the ray associated with the measuring values and by a second weighting factor which corresponds to the reciprocal value of the cosine of a fan angle of the beam associated with the measuring values, and 4) reconstructing the absorption of each object point by back projection of the weighted, integrated partial derivative of the measuring values. Popescu et al. is directed towards automatic exposure control in CT scanning and does not make up for these deficiencies of Ning. Accordingly, the rejection of claims 4 and 5 should be withdrawn.

Newly Added Claims

Claims 6-20 have been added to further emphasize various aspects of the invention. No new matter has been added.

Independent **claim 6** recites, *inter alia*, reconstructing measuring values as a function of corresponding projection angles to generate an image indicative of the examination zone. **Claim 7**, which depends from claim 6, recites that a projection angle is the angle enclosed by a PI line of an object point projected in a plane perpendicular to an axis of rotation. As discussed in the application, reconstructing measuring values as a function of corresponding projection angles (as opposed to reconstructing measuring values over angular positions of the radiation source on a helix with respect to a fixed reference angular position, as has been done in the art) allows faster, exact reconstruction of the absorption distribution in the examination region. (See page 1, lines 19-20, and page 8, lines 26-30). **Claims 15, 16 and 17** also recite limitations regarding reconstructing measuring values as a function of corresponding projection angles. Ning

and Popescu et al., individually and in combination, do not teach or suggest the above claimed aspects.

Claim 8 requires reconstructing the integrated partial derivative of the measuring values over projection angles. **Claims 13, 14 and 18** also recite limitations relating to reconstructing integrated partial derivative of the measuring values over projection angles. In contrast, Ning discloses integrating the inverse three-dimensional Radon transform over the interval $[0,\pi]$. Popescu et al. does not make up for this deficiency in Ning. As noted above, reconstructing based on Radon inversion requires a relatively large amount of calculation work and give rise to discretization errors in the reconstructed images. (See page 10, lines 12-14).

Dependent **claim 10** includes limitations that the Office has conceded are not taught or suggested in Ning or Popescu et al. In particular, claim 10 recites performing the weighted integration of the partial derivative of the measuring values by determining a K plane for each radiation source position and each location to be reconstructed in the examination zone, determining K lines (lines of intersection between the K planes and a detector surface of the detector unit), multiplying the partial derivative of the measuring values on each K line by a weighting factor that corresponds to a reciprocal value of a sine of a K angle, and integrating the partial derivative of the measuring values along the K lines. **Claims 9 and 19** also recite limitations regarding K lines.

Claim 11 recites that prior to the reconstruction step the integrated, partial derivative of the measuring values are multiplied by the same weighting factor. **Claim 12** is also directed to a reconstruction step in which a partial derivative of the measuring values are weighted with the same operands. As discussed in the application, using the same weighting factor (as opposed to using a weighting factor that varies with angular positions of the radiation source on a helix with respect to a fixed reference angular position, as has been done in the art) leads to a substantial reduction of the required amount of calculation work. (See page 10, lines 7-12). Ning and Popescu et al., individually and in combination, do not teach or suggest the above claimed aspects.

Claim 20 recites that the reconstructor back projects the measuring values using an exact 3D back projection technique.

It is believed that the prior art of record does not teach or suggest the aspects in new claims 6-20, and thus entry and allowance of these claims is kindly requested.

Conclusion

In view of the foregoing, it is submitted that the claims distinguish patentably and non-obviously over the prior art of record. An early indication of allowability is earnestly solicited.

Respectfully submitted,

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